



Diabetic Foot in Uttarakhand

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Abstract

The aim of the study was to evaluate the clinical and the bacteriological profile of patients with diabetic foot. The clinical and the bacteriological profile along with the antibiotic sensitivity pattern was assessed in patients with Diabetes mellitus over 3 years period (From January 2001 to December 2004). The foot ulcers were categorized as mild or non-limb threatening and severe or limb threatening. Cultures from the wounds were sent prior to the first debridement and the antibiotic sensitivity was done in each case. The possible risk factors responsible for these ulcers were also recorded. Out of 61 cases of diabetic foot ulcers, non-limb threatening infections were seen in 38 patients (62.29%) and the limb threatening was seen in 23 patients (37.7%). Of these 23 patients with limb threatening infections, 14 (60.87%) had to undergo amputation during one-year follow-up. The organisms isolated from the cultures included Staphylococcus sp in 15 patients (28.84%), Streptococcus sp in 11 (21.15%), Pseudomonas sp in 8 (15.38%), Enterococcus sp in 30 (57.69%) and anaerobes in 27 patients (51.92%). The antibiotics to which they were found to be most sensitive included Amoxy-Clav 49 (94.23%), Ceftriaxone 48(92.30%), Ceftazidime 41 (78.84%), Cefurexime 46 (88.46%), Cloremphenicol 44(84.61%), Amikacin 46(88.46%) and Polymixin-B 46 (88.46%).

Key Words

Diabetes mellitus, Foot ulcer

Introduction

Diabetes mellitus is recognized as an epidemic in the Asian sub-continent affecting nearly 25 millions in India alone. Diabetic foot ulcers are estimated to affect 15% of all diabetics during their lifetime and precede almost 85% of all foot amputations (1,2). Diabetes by virtues of its other complications like neuropathy and vasculopathy and other factors alter the musculoskeletal and soft tissue mechanics in a manner that elevates planter pressure and makes tissue damage more likely, causing non-resolving neuro-ischemic ulcers at the weight bearing sites. This is why most of the skin injuries in diabetics are seen on the planter surface, frequently at the site of highest pressure under the foot (3,4).

The present study assumes significance in the Indian context where the disease is itself detected late, there is

little awareness for foot care in patients and there is a significant delay in seeking the treatment. Further, a significant population is rural and work in the fields barefoot, thus increasing the chances of further infection. In such a situation, the treating physician is left with the option of treating empirically till the culture reports are available. A rough idea of the antibiotic pattern would be a useful aid for him.

Material and Method

A total of 61 patients with diabetic foot, both hospitalized as well as outpatients were included in the study. Informed consent was taken from each patient and the study protocol confirms to the ethical guidelines of the 1975 declaration of Helsinki. The mean age of these patients was 52.4 years and ranged from 32 to 67

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years. The subjects included 33 males and 28 females. The baseline characteristics of the study group are shown in table 1.

Table 1: Baseline characteristics of the study group N=61

Parameters	
Age (years)	52.4 +/- 11.77 years
Range	32 - 67 years
Sex	
Males	33
Females	28
Mean duration of diabetes	8.8 +/- 3.1 years
Foot ulcer	
Non -limb threatening	38 (62.29%)
Limb threatening	23 (37.7%)

The foot ulceration was classified as mild or non-limb threatening and severe or limb threatening. Non-limb threatening was characterized as superficial with <2cm of cellulitis, no significant ischemia, and no bone or joint involvement, with no systemic toxicity. The limb threatening ulceration was characterized as full thickness ulceration with >2cm cellulitis, serious ischemia/gangrene, bone or joint involvement with systemic toxicity. The features of systemic toxicity included systemic clinical features along with raised ESR, leukocytosis and polymorphonuclearcytosis. Only the subjects who showed growth from the culture of the wound site were included in the study. The specimens were taken for both aerobic and anaerobic culture at the time of presentation.

The investigations were done according to the diabetic clinic protocol. They included random blood sugar, fasting and post-prandial blood sugar, Glycosylated hemoglobin, urine-routine and microscopic, renal function test (BUN, serum creatinine), liver function tests, X-ray chest (PA) view, ECG and fundus examination. Aerobic and anaerobic culture and antibiotic sensitivity, complete blood count with ESR was done in each case. Probe to bone test was done in these cases in order to characterize the ulcer and for evidence of bone involvement. X-ray of the wound and MRI were done in all patients.

Results

Of the 61 patients included in the study, the wound cultures were done in all the cases and after 48-72 hours of incubation, the microbiological profile obtained is shown in table 2.

Table 2 : Microbiological profile of patients N=61

Organism	No. of patients	Percentage
Staphylococcus sp.	25	40.9
Streptococcus sp	11	21.15
Pseudomonas	8	15.38
Enterococcus sp.	30	57.69
Anaerobes	27	51.92

The Enterococcus sp. was most commonly isolated organism followed by the anaerobes. Staphylococcus sp. was isolated in 40.9% of the patients. Out of 61 patients, 52 (85.24%) had polymicrobial infection and in the rest 9 patients (14.75%), only single organism was isolated.

These patients were also evaluated for their antibiotic sensitivity pattern, which is as follows (Table 3) :

Table 3 : Antibiotic sensitivity pattern of patients N=61

Antibiotic	No. of patients	Percentage
Amoxycillin-clavulanic acid	57	93.44
Ceftriaxone	56	91.80
Ceftazidime	49	80.32
Cefuroxime	42	68.85
Cephalexin	33	54.09
Cephadroxil	31	50.81
Ampicillin	34	55.73
Cloxacillin	44	72.13
Co-trimexazole	46	75.40
Ciprofloxacin	52	85.24
Ofloxacin	51	83.60
Sparfloxacin	51	83.60
Chlormphenicol	55	90.16
Nitrofurantoin	52	85.24
Polymyxin B	53	86.88
Gentamycin	47	77.04
Amikacin	55	90.16

An effort was also made to find out the possible factors responsible for the development of Diabetic foot. A detailed history was taken in this regard and the foot was thoroughly examined for the pressure points on the sole. The factors are depicted in table 4.

Table 4 : Factors likely to be responsible for the development of Diabetic foot N=61

Factors	No. of Patients	Percentage
Ill-fitting shoes/ shoe related factors	32	52.45
Barefoot walking	12	19.67
Trivial trauma	6	9.83
Corn / in-growing nail etc.	6	9.83
Cause not known	5	8.19



Ill-fitting shoes and the shoe related factors were found to be the most common cause for the development and worsening of the foot ulcers. Habitual bare foot walking was seen in 19.67% of the patients. Trivial trauma and in-growing nail was seen in 20% of the remaining patients while the exact cause could not be found in 5 patients.

Discussion

India is a home of nearly 33 million diabetics, which is highest in the world out of which; nearly 15% suffers from the dreaded sequelae of diabetic foot (5). Certain types of infections are more common in diabetics, and others more severe. It is not only the numbers that is worrisome; the situation is different in India due to sociocultural practices as barefoot walking, religious practices like walking on fire, use of improper footwear and lack of knowledge regarding foot care attributes towards increase in the prevalence of diabetic foot.

Diabetic foot ulcers are not spontaneous ulcers, but results from the interplay of various factors like neuropathy, autonomic neuropathy, and peripheral vascular disease, superimposed with alterations in the plantar pressure, defective footwear and limited joint mobility. Cell mediated immunity is most affected with abnormalities of polymorphonuclear leukocytes (PMNL), monocytes and lymphocytes. There are abnormalities of adherence, chemotaxis, phagocytosis, oxidative burst and intracellular killing. Also, advanced glycation end products (AGE) leads to the state of low level persistent activation in PMNL which leads to spontaneous activation of the oxidative burst and the release of myeloperoxidase, elastase and other neutrophil granular component which may lead to burn out or tolerant PMNL and also, may initiate pathologic process leading to vascular injury (6,7). Adaptive cellular immunity is also affected with decreased lymphocyte proliferative response to stimulants such as *Staphylococcus aureus*. In the present study, *S. aureus* was isolated in nearly 40% patients, which is quite significant. The culture yield was improved by taking deep wound samples. Almost similar pattern of microbial growth was observed in other studies like that of Lipsky *et al* (1). However, in our study Enterococcus sp and the anaerobes were most prevalent.

Despite judicious use of antibiotics like Amoxicillin-Clavunalic acid and 3rd generation cephalosporins,

remarkable sensitivity patterns have been observed (93.44 and 91.8% respectively) indicating practically no resistance for these antibiotics. Gram-negative coverage especially with Amikacin was also found to be satisfactory with 90% patients sensitive to this antibiotic. It is significant to note that despite care in a tertiary center, 14 patients (22.95%) with foot ulcers and 60.87% with limb threatening ulcers had to undergo amputation during one-year follow-up.

In this region (Uttaranchal state), Ill-fitting shoes and shoe related conditions were more common than the habit of barefoot walking. This is probably attributed to the hilly terrain, poverty and improper pressure transmission on the sole with the conventional footwear. A relative cold climate also deters the habit of barefoot walking in this region. Trivial trauma and in-growing nail etc accounted for nearly 20% of such cases. In 5 cases (8.19%), no definite cause could be attributed.

Conclusion

Enterococcus sp, Staphylococcus sp and anaerobes are responsible for majority of the foot ulcers, which were sensitive to the conventional antibiotics indicating that there is no evidence to suggest significant resistance to these antibiotics. Hence their empirical usage, either oral or injectable (depending upon the type of foot ulcer) is justified. Proper education regarding footwear and foot care is strongly recommended in such patients.

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